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Description

[AN AIRCRAFT USING ENGINE-POWERED, SWIPING ROTATING-BODIES TO FLY]

BACKGROUND OF INVENTION

[0001] Field of invention: This invention relates to aerodynamics and flight dynamics devices. It is adaptable to various devices in the field of aerospace or engineering.

[0002] Discussion of the Prior Art: Magnus effect has been known to Physicists and engineers for a long time. It is obvious when a rotating-cylinder is moving perpendicular to its rotstion-axis in a fluid and generates a force perpendicular to the rotatin-axis. There are some designes in U.S. patent 1927538 issued to Zaparka (1933), using the energy of the flowing fluid around the machine to rotate some rotating-bodies to generate lift-force. In those designs there is no use of engine power to rotate the rotating bodies and as a result, there is no predicted mechanism to neutralize the reaction force of rotating the rotating bodies by engine. In addition, using the flowing fluid

around the machine to rotate the rotating-bodies, is less efficient than engine, thus less lift-force is generated, in comparison to the current design. Some attempts to use Magnus effect has led to inventions to inventions with other purposes, like controlling the stability of the aircraft (Calderson, 1964). Trey (1932) and Tino(1960) suggested to use rotating-bodies accessory to airfoils to increase lift force. However, the idea of using rotating bodies with, or instead of, airfoils has not get popularity. This is due to two major problems. First, the energy needed to rotate the rotating-bodies makes them low efficient. Second, the turbulant flow (which increases as the speed increases) that appears at the back of the rotating-bodies increases the drag-focre and decreases both the energy efficiency and lift-force generation which is partially dependent on the forward speed. Duo to these problems, designed flying machines have had poor fuel economy, limited speed, low lift-force generation. The current invention bypasses the mentioned problems by its low weight and by using rotating-bodies, which can swipe backward in higher speeds, lowering the resistance to air and decreasing the turbulance behind the rotating-bodies. The current invention is a breakthrough in personal flying machines.

Summary of Invention

[0003] In accordance with the current invention, the new flying machine system is composed of lift-force producing part (rotating-bodies), thrust-force producing part (propeller), engine, a connecting frame (body), two pulleys and their connecting belt. The lift-force producing part is composed of rotating-bodies, with circular cross-section, on either side of the machine, connected to, and rotated by, a pulley. The connection of rotating-bodies to the pulley can be rigid or flexible; in flexible form, it lets the rotating bodies to swipe back at high speeds; thus, it leads to decreased turbulence of the air at the back of the rotating-bodies and ultimately decreases drag-force. The rotating-bodies-connected pulley is connected by a belt to another pulley that is installed on a shaft connected to the engine. This shaft runs from back to forth, from the engine to the mentioned pulley and then to the propeller at the end. The propeller is the thrust-force generating device. To keep everything in the correct position, the engine is fixed to a frame that bears rotating-bodies on its upper side. At the upper side, the frame bears four small rollers-small cylinders, which rotate easily, making a low friction bed for the rotating-bodies and the pulley connecting the ro-

tating bodies to rotate with low friction.

[0004] Accordingly, an advantage of the current invention is the lower fuel consumption due to less drag-force in comparison to the other designs of flying machines, which use rotating-bodies to generate lift-force. Considering the fact that the drag-force, partially caused by turbulent airflow at the back of rotating-bodies, increases by increasing forward-speed, this effect has been reduced in the current invention by having a variable "angle" between the rotation-axis of the rotating-bodies and the back-front axis of the machine. Swiping back, reduces this angle from 90 degrees, and decreases the turbulence behind the rotating-bodies and ultimately decreases the drag-force (figure 7).

[0005] Another advantage of the current invention is less or no need to take-off-speed, which makes it possible to take-off without runway or with short runways. This is due to more efficient lift-force generation at lower speeds by rotating-bodies, which are rotated by engine, compared to airfoil. In addition, it is due to decreased drag-force by swiping the rotating-bodies backward (decreasing the angle between the rotating-bodies and the back-front axis mentioned above; (figure 7).

[0006] Yet another advantage of the current invention is the stability of flight, and resistance to leaning to left or right, during the flight, due to the gyro effect of the rotating-bodies.

[0007] Yet another advantage of the current invention is that, by usage of the inflatable rotating-bodies, instead of the rigid rotating-bodies, it is possible to deflate the rotating-body structure when needed. This makes the aircraft small enough to be packed, kept and carried in a very small space, and makes it ideal for personal usage; especially with easy and cheap shipping/handling due to the small volume.

[0008] Yet another advantage of the current invention is usage of engine for the first time to rotate the lift-force producing part and at the same time in generating thrust-force, thus generation of both of these forces can be under control.

[0009] Yet another advantage of the current invention is using engine power to rotate the rotating-bodies, which makes it possible to generate lift-force at start of moving forwards, or with low forward-speed, making it more practical than other methods of rotation for rotating-bodies, such as using the flowing air to rotate the rotating-bodies.

[0010] Yet another advantage of the current invention is to accelerate faster in flight, by taking-off sooner due to more lift-force generation by rotating-bodies with engine-power, and thus, lack of friction to the ground after take-off, and the lower drag-force due to swiping of the rotating-bodies backwards.

[0011] Yet another advantage of the current invention is three different ways to neutralize the reaction-force produced by rotating-bodies in the reverse direction to their rotation that can cause the machine to rotate in the opposite direction. These new mechanisms used to neutralize the reaction-force to the rotation of the rotating-bodies and make the new design specific:

[0012] 1. Placing the rotation-axis of the rotating-bodies upper than the center of gravity of the machine (and the load; figure 5).

[0013] 2. Placing the point of effect of thrust-force lower than the rotation-axis of the rotating-bodies (figure 4).

[0014] 3. Bending the rotating-bodies backwards at higher speeds to decrease the angle between the rotation-axis of the rotating-bodies to back-front- axis, to less than 90 degrees, and thus, the rotating-bodies do not align and their rotation reaction-force will be less than their numer-

ical summation.

[0015] Yet another advantage of the current invention is that, if a problem happens in the thrust-force generating parts and not in lift-force generating part, the aircraft can land more securely compared to conventional aircrafts. That is due to the fact that, any movement perpendicular to the rotation-axis induces a force perpendicular to the axis of movement; thus falling down causes a push to the flying machine forwards and forward movement causes lift-force. Thus if a problem in the propeller causes the aircraft to fall which ultimately due to Magnus effect decreases falling speed.

[0016] Yet another advantage of the current invention is less or no need to landing runway. Due to more lift-force generation by rotating-bodies at lower speeds, one can land at those speeds. Thus there is less or no need to runway, depending on the rotation speed of the rotating-bodies and the weight of the machine and its load (the heavier the load the more speed needed, and the faster the rotation-speed, the more the lift-force and the less the need for landing-speed).

Brief Description of Drawings

[0017] In the figures below, like numerals represent like ele-

ments:

[0018] Figure 1 is the solid drawing of the aircraft.

[0019] Figure 2 is semi-transparent view of the aircraft.

[0020] Figure 3 shows the Flying Machine with the rotating parts (rotating-bodies) removed.

[0021] Figure 4 shows opposing forces consisting of thrust-force and reaction-force of the rotating-bodies and the names of different parts in the aircraft.

[0022] Figure 5 shows opposing forces consisting of center of gravity of the machine (in addition to any added load) and reaction-force of the rotating-bodies.

[0023] Figure 6 shows opposing forces consisting of thrust-force and reaction-force of the rotating-bodies.

[0024] Figure 7 shows the difference between oblique and perpendicular cross-sections of rotating bodies.

[0025] Figure 8 shows frontal view of deflated rotating-bodies in this aircraft with some of the accessories like some possible ways of personal use and landing gears.

[0026] Figure 9 shows the frontal view of inflated rotating-bodies in this aircraft with transparent rollers.

[0027] Figure 10 shows the frontal view of deflated rotating-bodies in this aircraft.

[0028] Reference Numerals are as follows: 10: Pulley of rotating-cylinders, 12: Small rollers of frame, 14: Belt, 16: Propeller (thrust-force generating part), 18: Pulley, 20: Engine and body and load of the machine, 22: Connecting frame, 24: Rotating-cylinder, 26: Direction of rotation of Cylinders, 28: Direction of forward traction-force, 30: Two opposite forces, 32: Direction of reaction-force to the rotating-cylinders, 34: Two opposite forces, 36: Direction of forward traction-force, 38: Direction of weight of the machine and machine's load, 40: Front, 42: Back, 44: Up, 46: Down, 48: Left, 50: Right, 52: a passenger cabin with landing gears, 54: landing gears, 56: hanging by body from the flying machine, 58: hanging from the flying machine by hand. Note: the arrow from 46 to 44 is the direction of lift-force generated when the rotating-bodies are rotating in the shown direction and the machine is moving from 43 to 40.

DETAILED DESCRIPTION

[0029] The machine is composed of functionally five different parts: lift-force producing part consisting of two inflatable rotating-bodies with circular cross-section (like cylinders), forward-force producing part consisting a propeller and its shaft, a power producing engine and its shaft, a frame

for fixing the lower position of engine and propeller to the rotating-bodies and making a low friction bed for lift-producing rotating-bodies with four small rollers, and power transfer part consisting of two pulleys and a belt, one pulley connected to rotating-bodies and the other one on a shaft that is connected to the engine, and a belt connecting them to transfer power from the engine to the lift-force producing part (propeller in Figures 1, 2 and 3). The lift-force producing part (Figures 1 and 2) is composed of two inflatable rotating-bodies (Figures 8, 9 and 10), on the sides, that are connected to a pulley that has an axis of rotation which is transverse to the front-back axis of the machine. The attachment of the rotating-bodies to the pulley can be flexible in a way that lets the rotating-bodies to swipe back at this junction at higher speeds (which cause more drag-force). Thus, backward swiping decreases the air-friction, by changing the angle at which the rotating-bodies touch hit the wind, and by decreases the turbulence behind the rotating-bodies. By inflating the rotating-bodies more, or by fixing the connection to the pulley, the connection becomes inflexible and acts like a fixed connection and the two rotating-bodies act like a single long rotating-body. This mentioned

pulley is connected to another pulley on the engine shaft by a belt. The rotation-axis of the second pulley is front-back, and thus the belt is not only transferring force but also changing the direction of rotation by 90 degrees, while transferring power from the pulley on the connected to the shaft of the engine to the pulley connected to the rotating-bodies. The ratio between the diameters of the two pulleys determines the ratio between speeds of rotation of the two pulleys. The position of the pulley on the engine shaft is between the propeller and the engine, thus the engine power generates both thrust-force and at the same time is transferred to the rotating-bodies and rotates them. To keep every part of the aircraft in a fixed position in relation to each other - i.e. the center of gravity and the propeller (or any other thrust-force generating device) should be placed lower than rotating-bodies (i.e. lift-force generating part) - the engine and pulley of the rotating-bodies are fixed to a frame (figure 3). The engine is connected to the frame with a fixed connection, but the pulley can rotate on four small low friction rollers installed on the frame. The inflatable rotating-bodies can be deflated and packed in a compact space (figure 8, 9 and 10) which helps keeping the machine or transporting it easily

in a smaller space.

[0030] The current invention can be made at different sizes for different purposes. For example, it can be used as a handheld personal flying machine, or can be used at larger sizes for more load or personal carriage, and can be adjusted by addition of accessory parts like landing gears or loading parts. Also by adding other accessory parts, the angle between the rotation-axis of the rotating-bodies and the front-back axis can be under control, the pilot or piloting system, during the flight.